2011 Candidate MVP Portfolio

Technical Studies Task Force
December Meeting

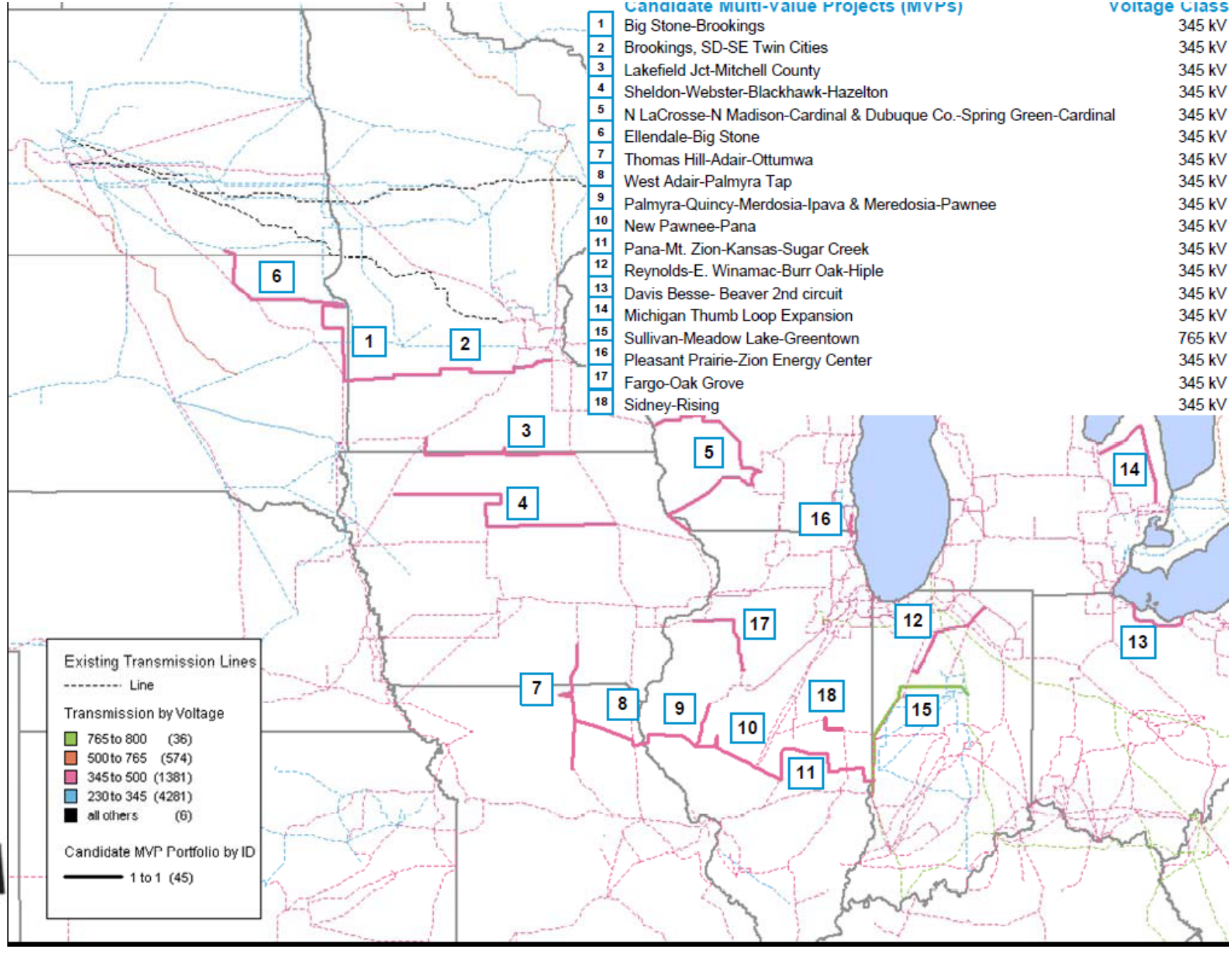
Carmel, IN/ St. Paul, MN
December 13, 2010

Agenda

• **10:00**	**Welcome and Roll Call**	**M. Tackett**
• 10:15	Revised FCITC Results	D. Chatterjee
• 11:00	Break	
• 11:15	Detailed Study Flowchart and Process	D. Chatterjee
• 12:00	Lunch	
• 1:00	Project Plan Modifications	R. Pulkrabek
• 1:30	Status Report and Action Items	R. Pulkrabek
• 2:00	Next Steps	M. Tackett

MidwestISO
Energizing the Heartland

Candidate MVP Portfolio



	Candidate Multi-Value Projects (MVPs)	Voltage Class
1	Big Stone-Brookings	345 kV
2	Brookings, SD-SE Twin Cities	345 kV
3	Lakefield Jct-Mitchell County	345 kV
4	Sheldon-Webster-Blackhawk-Hazelton	345 kV
5	N LaCrosse-N Madison-Cardinal & Dubuque Co.-Spring Green-Cardinal	345 kV
6	Ellendale-Big Stone	345 kV
7	Thomas Hill-Adair-Ottumwa	345 kV
8	West Adair-Palmyra Tap	345 kV
9	Palmyra-Quincy-Merdosia-Ipava & Meredosia-Pawnee	345 kV
10	New Pawnee-Pana	345 kV
11	Pana-Mt. Zion-Kansas-Sugar Creek	345 kV
12	Reynolds-E. Winamac-Burr Oak-Hiple	345 kV
13	Davis Besse- Beaver 2nd circuit	345 kV
14	Michigan Thumb Loop Expansion	345 kV
15	Sullivan-Meadow Lake-Greentown	765 kV
16	Pleasant Prairie-Zion Energy Center	345 kV
17	Fargo-Oak Grove	345 kV
18	Sidney-Rising	345 kV

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Energy Delivery Analysis: FCITC Constraint Identification

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Purpose

- First Contingency Incremental Transfer Capability (FCITC)
- Performed on preliminary powerflow case
- Linear approximation of transfer limits
- Constrained Monitored Element and Contingency “Events” passed on to PROMOD

Input Files

- Model
  - Without MVP - MTEP10 Phase 2 - 2015SH base case
    - MTEP11 models not yet ready
    - Best internal MISO topology
    - Approved Michigan Thumb Loop MVP added to Base Case
  - With MVP – w/o case plus all candidate MVPs added

- Contingencies Tested
  - MTEP10 East, Central and West
    - Single (NERC Cat B), Bus Section (NERC Cat C1), Breaker Failure (NERC Cat C2) and Double circuit tower outage (NERC Cat C5)

- Monitored
  - MTEP10 Monitored Elements

Transfer – Source & Sink Definition

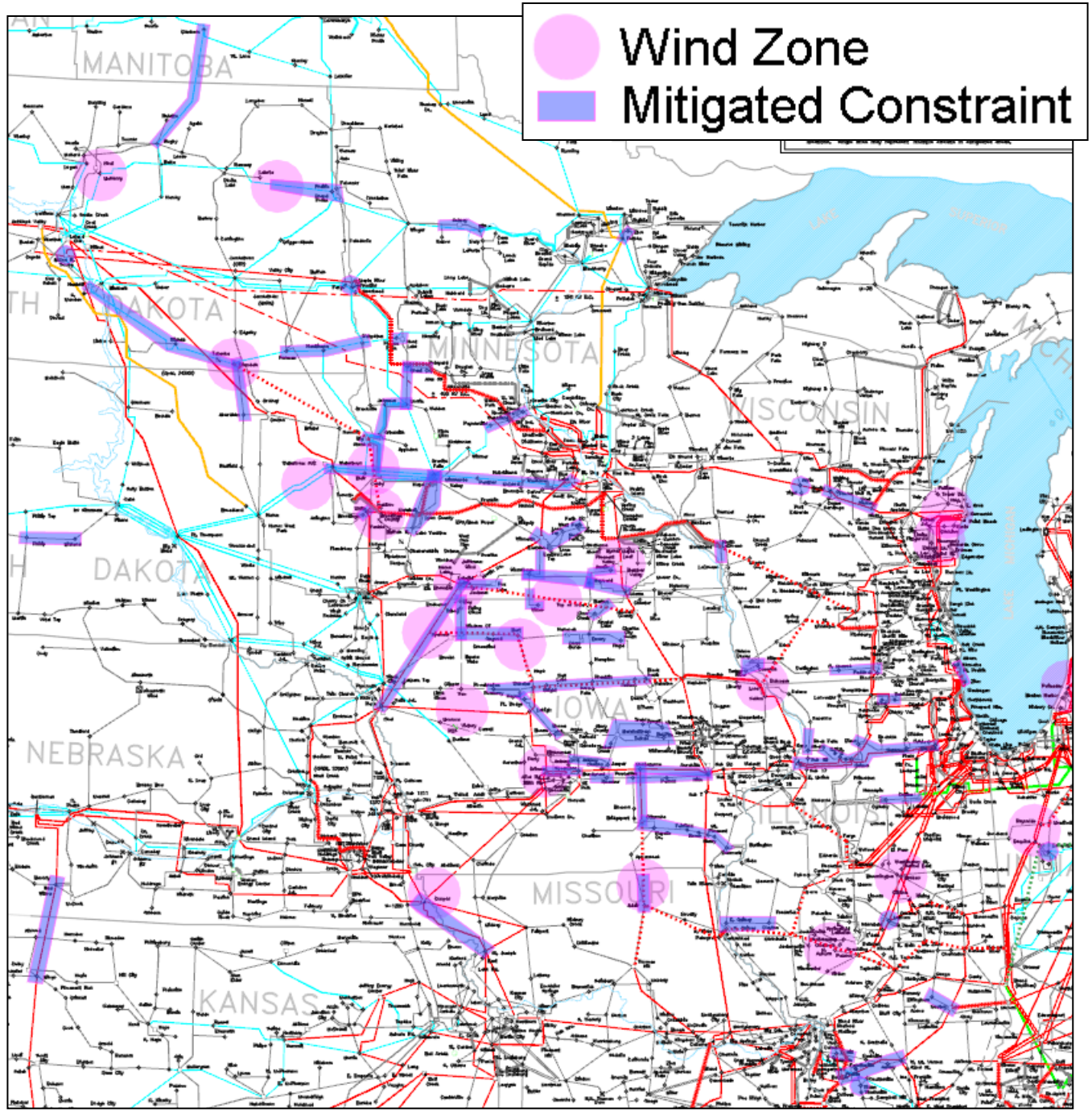
- Source (10.2 GW total)
  - 2021 Wind Zone levels developed from RPS requirements (8.8 GW)
  - Existing and planned wind (incremental beyond already modeled 90%)

- Sink (10.2 GW total)
  - Used MTEP10 RMD to curtail highest cost units

Conservative Approach

- Monitored elements screened at 90% of rating
- Prefer more potential events to go into PROMOD

Mitigated Constraints



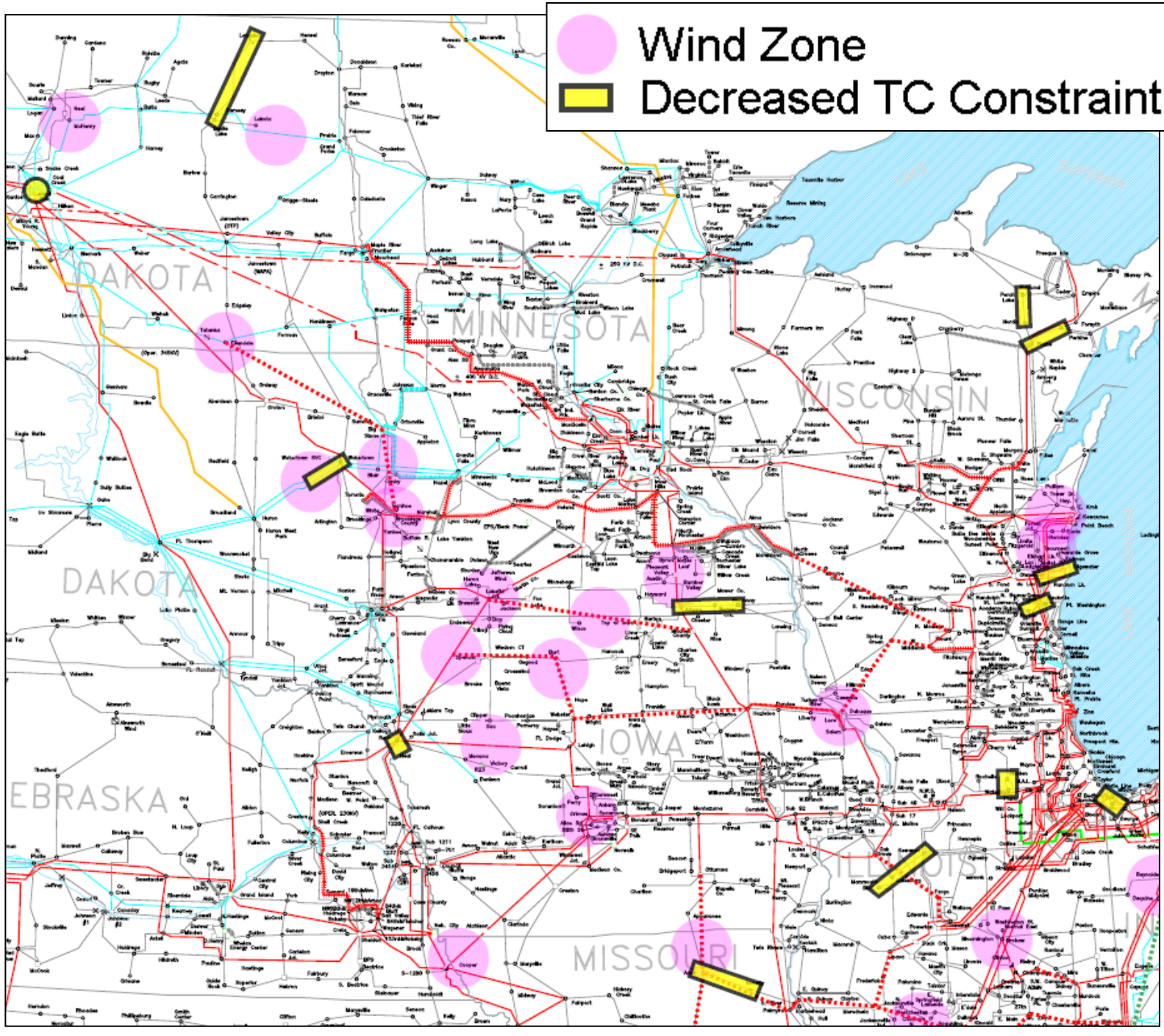
Mitigated

Mitigated Constraints			
Monitored Element	Control Area	Monitored Element	Control Area
249771 08LAF 2 138 249853 08STALYN 138 1	208 DEM	602006 SHEYNNE4 230 652435 FARGO 4 230 1	620 OTP
270700 CORDO; B 345 270828 NELSO; B 345 1	222 CE	602008 MINVALT4 230 B$0036 1.00 6	600 XEL
270730 ELECT; B 345 270828 NELSO; B 345 1	222 CE	602009 MNVLTAP4 230 615529 GRE-PANTHER4 230 1	600 XEL
270828 NELSO; B 345 270890 H471 ; 345 1	222 CE	602014 BLUE LK4 230 619940 GRE-MCLEOD 4 230 1	600 XEL
270828 NELSO; B 345 275203 NELSO;2M 138 1	222 CE	603001 W FARIB7 115 603122 LOONLKTP 115 1	600 XEL
270864 QUAD3-11 345 270890 H471 ; 345 1	222 CE	603002 WILMART7 115 603003 SWAN LK7 115 1	600 XEL
270981 ALPIN;RT 138 271083 BELVI; R 138 1	222 CE	603002 WILMART7 115 603188 EASTWD18 115 1	600 XEL
271332 DIXON; B 138 271333 DIXON; R 138 1	222 CE	603002 WILMART7 115 B$0230 1.00 9	600 XEL
271333 DIXON; R 138 272002 MCGIR; 138 1	222 CE	603002 WILMART7 115 B$0314 345/115 1.00 10	600 XEL
271543 GARDE; 138 272512 H71 ;BT 138 1	222 CE	603005 DOME 7 115 603186 SUMMIT 115 1	600 XEL
271680 HAUME; R 138 272516 STEWA; B 138 1	222 CE	603005 DOME 7 115 603188 EASTWD18 115 1	600 XEL
271680 HAUME; R 138 272756 W DEK;3T 138 1	222 CE	603010 LKYNKTN7 115 603046 LYON CO7 115 2	600 XEL
271987 MAZON; R 138 272189 OGLES; T 138 1	222 CE	603030 MINVALY7 115 603046 LYON CO7 115 1	600 XEL
272002 MCGIR; 138 272365 H440 ;RT 138 1	222 CE	603030 MINVALY7 115 652551 GRANITF7 115 1	600 XEL
272095 NELSO; R 138 275203 NELSO;2M 138 1	222 CE	603030 MINVALY7 115 B$0036 1.00 6	600 XEL
272896 ZION ; 138 699362 LAKEVIEW 138 1	222 CE	603034 PYNSVIL7 115 603039 WAKEFLD7 115 1	600 XEL
300075 5ESSEX 161 345790 5STODDARD 161 1	330 AECI	603037 STCTPW 7 115 603039 WAKEFLD7 115 1	600 XEL
344001 5ADAIR 161 700018 WZ_MO-C 161 1	356 AMMO	603046 LYON CO7 115 658068 MARSHAL7 115 1	600 XEL
346869 4CLAY JCT 138 348058 4QUINCY E 138 1	357 AMIL	603122 LOONLKTP 115 603188 EASTWD18 115 1	600 XEL
347000 4E.QUINCY 138 348058 4QUINCY E 138 1	357 AMIL	603182 SOUTH BEND 7 115 B$0172 1.00 5	600 XEL
347000 4E.QUINCY 138 348198 4S.QUINCY 138 1	357 AMIL	608721 ETCO 7 115 608722 FORBES 7 115 1	608 MP
347016 4EFFGHMNW 138 347024 4EFFINGHM 138 1	357 AMIL	613040 AUSTIN 5 161 631044 HAYWD#25 161 1	680 DPC
347830 7NEWTON 345 347831 4NEWTON 138 1	357 AMIL	615529 GRE-PANTHER4 230 619940 GRE-MCLEOD 4 230 1	600 XEL
347830 7NEWTON 345 347831 4NEWTON 138 2	357 AMIL	615529 GRE-PANTHER4 230 B$0299 230/69 1.00 1	600 XEL
348058 4QUINCY E 138 348267 4ST.ANTH 138 1	357 AMIL	616002 GRE-JOHNJCT7 115 620216 ORTONVL7 115 1	620 OTP
348059 4QUINCY S 138 348267 4ST.ANTH 138 1	357 AMIL	616002 GRE-JOHNJCT7 115 652555 MORRIS 7 115 1	620 OTP
348060 SQUINLOX 138 348198 4S.QUINCY 138 1	357 AMIL	619940 GRE-MCLEOD 4 230 B$0291 230/115 1.00 1	600 XEL
348773 7PR STATE 345 348827 7W MT VERNON 345 1	357 AMIL	619941 GRE-MCLEOD 7 115 B$0291 230/115 1.00 1	615 GRE
348777 4TURKEY HILL 138 348824 4MASCOUTAH 138 1	357 AMIL	619975 GRE-WILLMAR4 230 B$0301 230/69 1.00 1	615 GRE
348784 4SPARTA TAP 138 348786 4TILDEN JCT 138 1	357 AMIL	619976 GRE-WILLMAR7 115 B$0248 115/69 1.00 1	615 GRE
349700 7LANSVLAM 345 349701 4LANVL AM 138 1	357 AMIL	620193 FORMAN Y 230 620263 FORMN 7 115 1	620 OTP
531451 MINGO 7 345 640325 REDWILO3 345 1	534 SUNC	620193 FORMAN Y 230 620363 FORMAN 4 230 1	620 OTP
541199 ST JOE 3 345 640139 COOPER 3 345 1	540 MIPU	620195 BIGSTONY 230 620214 BIGSTON7 115 1	620 OTP
601004 WILMART3 345 B$0230 1.00 9	600 XEL	620195 BIGSTONY 230 620314 BIGSTON4 230 1	620 OTP
601004 WILMART3 345 B$0314 345/115 1.00 10	600 XEL	620212 BURR 7 115 620213 MARIETT7 115 1	620 OTP
601043 NLAX 5 161 602026 MAYFAIR5 161 1	680 DPC	620213 MARIETT7 115 620214 BIGSTON7 115 1	620 OTP
602002 SOUTHBE5 161 602003 BLUEETA5 161 1	600 XEL	620214 BIGSTON7 115 620215 HIWY12 7 115 1	620 OTP
602002 SOUTHBE5 161 B$0172 1.00 5	600 XEL	620215 HIWY12 7 115 620216 ORTONVL7 115 1	620 OTP
602003 BLUEETA5 161 631043 WINBAGO5 161 1	600 XEL	620219 GRANTCO7 115 652555 MORRIS 7 115 1	620 OTP

Mitigated (cont.)

Mitigated Constraints			
Monitored Element	Control Area	Monitored Element	Control Area
620220 ELBOWLK7 115 620221 BRANDN 7 115 1	620 OTP	631143 OTTUMWA3 345 635730 MNTZUMA3 345 1	627 ALTW
620223 HOOT LK7 115 620231 FERGSFL7 115 1	620 OTP	631163 FARIBLT5 161 681529 WINNCO 5 161 1	627 ALTW
620239 BAGLEY 7 115 620243 SHEVLIN7 115 1	620 OTP	631183 CAYLER5 161 656570 WISDOM 5 161 1	627 ALTW
620243 SHEVLIN7 115 620285 SOLWAY 7 115 1	620 OTP	635200 RAUN 3 345 635399 R39 TP3 345 1	635 MEC
620245 WILTON 7 115 657711 SCRIBNR7 115 1	620 OTP	635600 GRIMES 3 345 635700 SYCAMOR3 345 1	635 MEC
620263 FORMN 7 115 652438 FORMAN 7 115 1	620 OTP	635600 GRIMES 3 345 635700 SYCAMOR3 345 2	635 MEC
620281 WILT TAP 115 620285 SOLWAY 7 115 1	620 OTP	635680 BONDRNT3 345 635700 SYCAMOR3 345 1	635 MEC
620281 WILT TAP 115 657711 SCRIBNR7 115 1	620 OTP	635730 MNTZUMA3 345 636400 HILLS 3 345 1	635 MEC
620327 HANKSON4 230 620329 WAHPETN4 230 1	620 OTP	636001 WEBSTER5 161 636025 HAYES 5 161 1	635 MEC
620327 HANKSON4 230 620363 FORMAN 4 230 1	620 OTP	636001 WEBSTER5 161 636050 WRIGHT 5 161 1	635 MEC
620379 RUGBY 4 230 667052 GLENBOR4 230 1	620 OTP	636020 FT.DODG5 161 636023 TATELYL5 161 1	635 MEC
631004 M-TOWN 7 115 631013 BLRSTWN7 115 1	627 ALTW	636025 HAYES 5 161 636030 POMEROY5 161 1	635 MEC
631013 BLRSTWN7 115 631017 PRAR CK7 115 1	627 ALTW	636050 WRIGHT 5 161 636235 WALL LK5 161 1	635 MEC
631033 ALBANY 6 138 631067 ALBANY 5 161 1	627 ALTW	636200 BLKHAWK5 161 636225 UNIONTP5 161 1	635 MEC
631041 LAKEFLD5 161 631042 FOX LK 5 161 1	627 ALTW	636225 UNIONTP5 161 636240 BUTLER 5 161 1	635 MEC
631043 WINBAGO5 161 631045 WNBAGOS5 161 1	627 ALTW	636230 FRANKLN5 161 636235 WALL LK5 161 1	635 MEC
631044 HAYWD#25 161 631127 HAYWD#15 161 1	627 ALTW	636230 FRANKLN5 161 636240 BUTLER 5 161 1	635 MEC
631045 WNBAGOS5 161 631127 HAYWD#15 161 1	627 ALTW	652443 GRNDFKS7 115 657706 FALCONR7 115 1	652 WAPA
631047 LIME CK5 161 631154 BARTON5 161 1	627 ALTW	652481 MIDLAND7 115 652487 PHILIP 7 115 1	652 WAPA
631048 EMERY 5 161 631049 CGORDO_5 161 1	627 ALTW	652503 BLAIR 4 230 652550 GRANITF4 230 1	652 WAPA
631048 EMERY 5 161 636300 FLOYD 5 161 1	627 ALTW	652504 BROOKNG7 115 652538 WHITE 7 115 1	652 WAPA
631049 CGORDO_5 161 631103 HANCOCK5 161 1	627 ALTW	652508 S3 7 115 658072 ERIE RD7 115 1	652 WAPA
631060 TRK RIV5 161 681519 CASVILL5 161 1	627 ALTW	652530 WATERTN4 230 652550 GRANITF4 230 1	652 WAPA
631064 BVR CH 5 161 631067 ALBANY 5 161 1	627 ALTW	656423 BURT 5 161 656527 OSGOOD 5 161 1	652 WAPA
631079 BNE JCT5 161 636020 FT.DODG5 161 1	627 ALTW	656527 OSGOOD 5 161 656570 WISDOM 5 161 1	652 WAPA
631081 M-TOWN 5 161 631082 TIMBRCK5 161 1	627 ALTW	657755 PRAIRIE4 230 700022 WZ_ND-M 230 1	620 OTP
631082 TIMBRCK5 161 631128 HIGHLDA5 161 1	627 ALTW	657756 SQBUTTE4 230 657791 CENTER 3 345 1	620 OTP
631083 TRAER 5 161 631086 DYSART 5 161 1	627 ALTW	660000 ABDNJCT7 115 660001 ABDNSBT7 115 1	652 WAPA
631085 PARNEL 5 161 631113 POWESHK5 161 1	627 ALTW	660000 ABDNJCT7 115 661027 ELLENDL7 115 1	652 WAPA
631085 PARNEL 5 161 636401 HILLS 5 161 1	627 ALTW	661026 ELLENDL4 230 B$0211 1.00 1	661 MDU
631102 TRIBOJI5 161 631124 DKSN_CO5 161 1	627 ALTW	661027 ELLENDL7 115 B$0211 1.00 1	661 MDU
631106 HENRYCO5 161 631108 DENMARK5 161 1	627 ALTW	661042 HESKETT4 230 661094 WISHEK 4 230 1	661 MDU
631106 HENRYCO5 161 631111 JEFF 5 161 1	627 ALTW	661094 WISHEK 4 230 661096 TTNKPOI4 230 1	661 MDU
631107 JASPER 5 161 635710 NEANKNY5 161 1	627 ALTW	681519 CASVILL5 161 699010 NED 161 161 1	680 DPC
631110 WAPELLO5 161 631111 JEFF 5 161 1	627 ALTW	698928 WERNER W 345 699785 ROCKY RN 345 1	295 WEC
631115 OTTUMWA5 161 631143 OTTUMWA3 345 1	627 ALTW	699036 NOM 138 138 699037 ALB 138 138 1	694 ALTE
631117 REASNOR5 161 635670 DMOINES5 161 1	627 ALTW	699037 ALB 138 138 699897 BASSCRK 138 1	694 ALTE
631123 ADAMS_S5 161 631127 HAYWD#15 161 1	627 ALTW	699244 ARP 345 345 699245 ARP 138 138 1	694 ALTE
631138 LAKEFLD3 345 635399 R39 TP3 345 1	627 ALTW	699345 KENOSH45 138 699362 LAKEVIEW 138 1	295 WEC

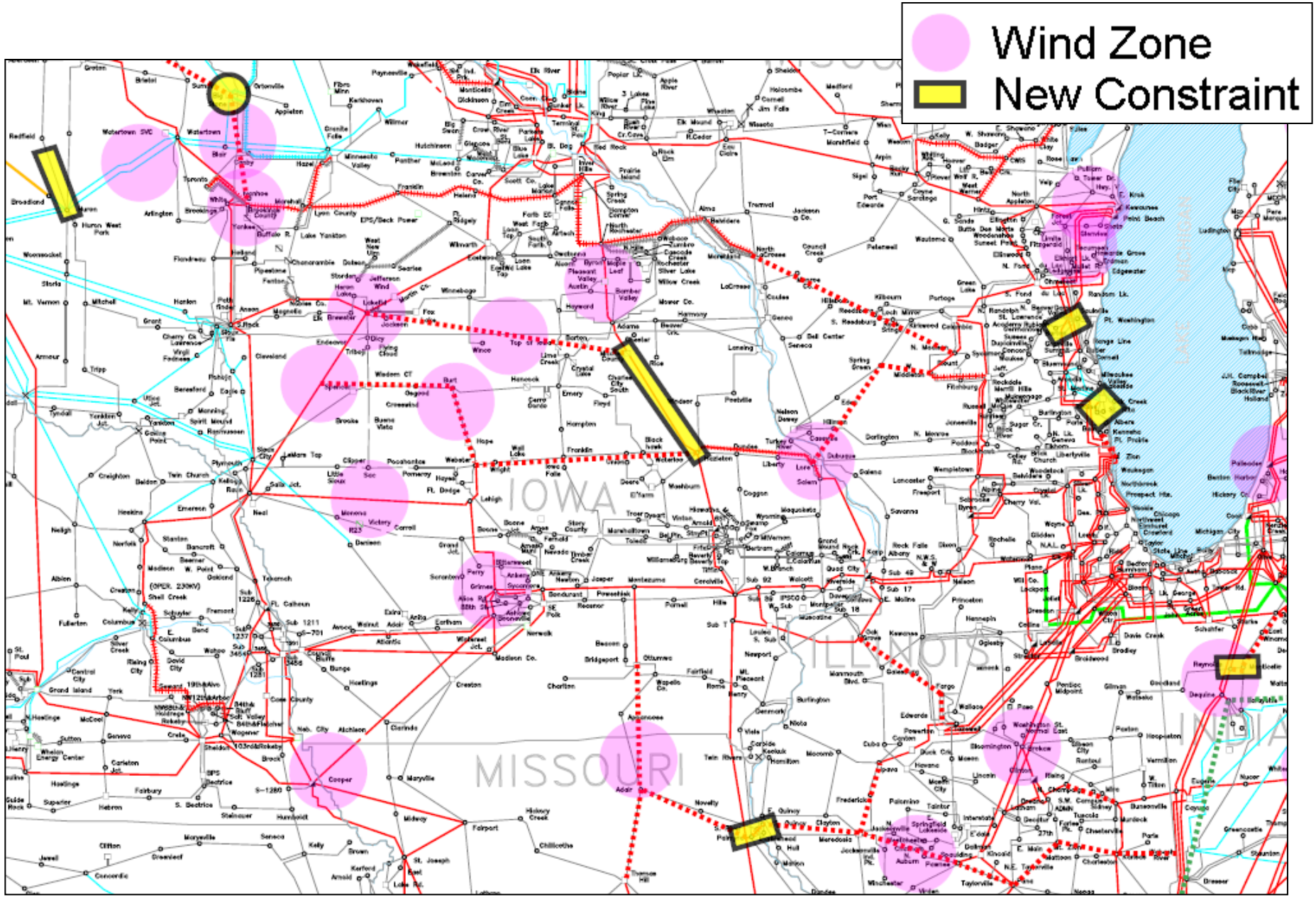
Decreased Transfer Capability Constraints



Decreased Transfer Capability

Decreased Transfer Capability Constraints	
Monitored Element	Control Area
255160 17MRKTNE 138 255176 17SHEFLD 138 1	217 NIPS
271558 GLIDD; B 138 272757 W DEK;7T 138 1	222 CE
300106 5NOVELY 161 344001 5ADAIR 161 1	330 AECI
348915 4E GALESBG N 138 348945 4E GALESBG S 138 1	357 AMIL
348916 4MONM BLVD E 138 348945 4E GALESBG S 138 1	357 AMIL
348924 4KEWANEE STP 138 348945 4E GALESBG S 138 1	357 AMIL
620265 DEVILSE7 115 657720 SWEETWA7 115 1	620 OTP
631123 ADAMS_S5 161 681527 BVR CRK5 161 1	627 ALTW
635201 RAUN 5 161 635203 NEAL N 5 161 1	635 MEC
635201 RAUN 5 161 635203 NEAL N 5 161 2	635 MEC
652530 WATERTN4 230 700030 WZ_SD-H 230 2	652 WAPA
657709 LANGDON7 115 657720 SWEETWA7 115 1	620 OTP
659156 SELBY 3 345 B$1476 SEL KUIA 1.00 1	652 WAPA
659157 SELBY 4 230 B$1476 SEL KUIA 1.00 1	652 WAPA
681527 BVR CRK5 161 681528 HARMONY5 161 1	680 DPC
699214 EDG 345 345 699396 CEDRSAUK 345 1	694 ALTE
699258 AUBURN 138 699269 BUTTRNT5 138 1	295 WEC
699566 NORDIC 138 699894 PERCH LK 138 1	295 WEC
699569 PLAINS 138 699581 ARNOLD 138 1	295 WEC

New Constraints



New

New Constraints	
Monitored Element	Control Area
255158 17MONTCL 138 255173 17RYNLDS 138 1	217 NIPS
345436 7PALMYRA 345 345437 5PALMYRA 161 1	356 AMMO
345437 5PALMYRA 161 347515 4MARBHD N 138 1	356 AMMO
347515 4MARBHD N 138 348060 7SE QUINCY 345 1	357 AMIL
620313 BIGSTON3 345 620314 BIGSTON4 230 1	620 OTP
631139 HAZLTON3 345 631144 MITCHLCO3 345 1	627 ALTW
652515 HURON 7 115 660009 BTAP WP7 115 1	652 WAPA
698868 RACINE6 138 699371 OC CRK-2 138 1	295 WEC
699258 AUBURN 138 699261 BARTON 138 1	295 WEC
699371 OC CRK-2 138 699481 ST RITA 138 1	295 WEC

Increased Transfer Capability

Increased Transfer Capability Constraints			
Monitored Element	Control Area	Monitored Element	Control Area
253505 10ABBRWN 138 253620 10ABB345 345 T1	210 SIGE	620238 WINGER 7 115 620239 BAGLEY 7 115 1	620 OTP
253519 10CATO_T 138 253542 10SIGTAP 138 84	210 SIGE	620329 WAHPETN4 230 620331 FERGSFL4 230 1	620 OTP
270695 CHERR; R 345 275166 CHERR;2M 138 1	222 CE	620362 OAKES 4 230 620363 FORMAN 4 230 1	620 OTP
270941 ZION ; R 345 698849 PLS PR2 345 1	222 CE	620362 OAKES 4 230 661026 ELLENDL4 230 1	620 OTP
271192 CHERR; B 138 275166 CHERR;2M 138 1	222 CE	631004 M-TOWN 7 115 631081 M-TOWN 5 161 1	627 ALTW
271975 MAREN;RT 138 272257 P VAL; R 138 1	222 CE	631074 GR JCT 5 161 631077 PERRY 5 161 1	627 ALTW
272728 WATER; B 138 272730 WATER;3B 138 1	222 CE	631074 GR JCT 5 161 656283 DRAGER 5 161 1	627 ALTW
344543 4ESTER TP2 138 345610 4RIVMIN 2 138 1	356 AMMO	631113 POWESHK5 161 631117 REASNOR5 161 1	627 ALTW
345408 7OVERTON 345 B$0178 1.00 1	356 AMMO	635001 CBLUFFS5 161 635030 RIVRBND5 161 1	635 MEC
345409 5OVERTON 161 B$0178 1.00 1	356 AMMO	635030 RIVRBND5 161 635031 BUNGE 5 161 1	635 MEC
347831 4NEWTON 138 348126 4ROBNSNAM 138 1	357 AMIL	635031 BUNGE 5 161 635032 HASTING5 161 1	635 MEC
348774 7BALDWIN 345 348775 4BALDWIN 138 1	357 AMIL	635310 VICTORY5 161 635320 CARROLL5 161 1	635 MEC
348915 4E GALESBG N 138 636672 GALESBR5 161 1	357 AMIL	635320 CARROLL5 161 656283 DRAGER 5 161 1	635 MEC
348915 4E GALESBG N 138 636672 GALESBR5 161 2	357 AMIL	635680 BONDRNT3 345 635730 MNTZUMA3 345 1	635 MEC
602006 SHEYNNE4 230 620336 AUDUBON4 230 1	620 OTP	636030 POMEROY5 161 B$0172 1.00 1	635 MEC
602009 MNVLTAP4 230 652550 GRANITF4 230 1	600 XEL	636636 OAKGROV5 161 636672 GALESBR5 161 1	635 MEC
603010 LKYNKTN7 115 603134 BUFFRID7 115 1	600 XEL	640302 OGALALA4 230 659134 SIDNEY 4 230 1	640 NPPD
603030 MINVALY7 115 603177 MAYNARD7 115 1	600 XEL	652481 MIDLAND7 115 652491 IRVSIMM7 115 1	652 WAPA
603140 INOPUMP7 115 603141 IRONRIV7 115 1	600 XEL	652482 MISSION7 115 652495 WITTEN 7 115 1	652 WAPA
603141 IRONRIV7 115 608632 DAHLBRG7 115 1	600 XEL	652626 UTICAJC7 115 660006 YKNTJCT7 115 1	652 WAPA
603142 BAYFRNT7 115 680386 PILSEN7 115 1	600 XEL	693580 CYPRESS 345 699247 ARCADN3 345 1	295 WEC
603177 MAYNARD7 115 616004 GRE-KERKHOT7 115 1	600 XEL	693697 LAU ROAD 138 699299 ELKHT L 138 1	295 WEC
608632 DAHLBRG7 115 608684 STIN-WI7 115 1	608 MP	698840 ACEC BADGERW 138 699240 SAR 138 138 1	694 ALTE
608666 FONDULAC 115 608676 HIBBARD7 115 1	608 MP	698840 ACEC BADGERW 138 699808 PETENWEL 138 1	694 ALTE
613370 RUTLAND5 161 631042 FOX LK 5 161 1	627 ALTW	699033 DAR 138 138 699036 NOM 138 138 1	694 ALTE
613370 RUTLAND5 161 631043 WINBAGO5 161 1	627 ALTW	699242 SGL 138 138 699245 ARP 138 138 1	694 ALTE
615347 GRE-MCHENRY4 230 B$0293 230/115 1.00 1	615 GRE	699299 ELKHT L 138 699955 SAUKVL4 138 1	295 WEC
615348 GRE-MCHENRY7 115 B$0293 230/115 1.00 1	615 GRE	699341 MEYER RD 138 699643 TECUM RD 138 1	295 WEC
619975 GRE-WILLMAR4 230 652550 GRANITF4 230 1	615 GRE	699532 FALLS WE 138 699570 MORGAN 138 1	295 WEC
620222 ALEXAND7 115 658050 ALEXSS 7 115 1	620 OTP		

Submitted CapX Events

Overloaded Facility	Contingency
Lk Marion-Kenrick 115 kV	Air Lake-Lake Marion 115 kV
Kenrick-Ritter Park 115 kV	Air Lake-Lake Marion 115 kV
Ritter Park-Dakota Heights 115 kV	Air Lake-Lake Marion 115 kV
Dakota Heights-Burnsville 115 kV	Air Lake-Lake Marion 115 kV
Wilmarth-Eastwood 115 kV	Wilmarth-Summit 115 kV
Minn Valley-Maynard 115 kV	Granite Falls-Wilmar 230 kV
Franklin 115/69 kV #1 & #2	Cedar Mountain-Helena 345 kV #1 & #2 or 5N91 Bkr Failure at Franklin (takes out Fort Ridgely line and 115/69 kV xfmr 2)
New Ulm-New Ulm Tap 69 kV	5S95 Breaker Failure (takes out Fort Ridgely-Swan Lake-MEC 115 kV and Fort Ridgely 115/69 kV transformer)
Lyon Cty-Walnut Grove Tap 69 kV	5X774 Breaker Failure (loss of Pipestone 115 kV bus and line to Buffalo Ridge)
Lake Marion 115/69 kV #2	Lake Marion-Hampton Corner 345 kV or Loss of Lake Marion 115/69 kV #1
Fort Ridgely-Schilling Tap 69 kV	Cedar Mountain-Helena 345 kV #1 & #2
Crystal Tap-Arlington 69 kV	Cedar Mountain-Helena 345 kV #1 & #2
Crystal Tap-Gaylord 69 kV	Cedar Mountain-Helena 345 kV #1 & #2
Gaylord-Heartland 69 kV	Cedar Mountain-Helena 345 kV #1 & #2
Winthrop-Heartland 69 kV	Cedar Mountain-Helena 345 kV #1 & #2
Winthrop-Cornish 69 kV	Cedar Mountain-Helena 345 kV #1 & #2

Submitted ATC Events

Element	Contingency
Arrowhead - Potlatch 230 kV	Base Case
Arcadia - Zion 345 kV	Base Case
Zion - Pleasant Prairie 345 kV	Base Case
Saratoga - Petenwell 138 kV	Arpin 345/138 kV Xfmr
Arrowhead - Stone Lake 345 kV	Eau Claire - Arpin 345 kV
Saratoga - Petenwell 138 kV	Eau Claire - Arpin 345 kV
Saratoga - Petenwell 138 kV	Sigel - Arpin 138 kV
Darlington - North Monroe 138 kV	Nelson Dewey 161/138 kV
Albany - Bass Creek 138 kV	Paddock 345/138 kV Xfmr
Cassville - Nelson Dewey 161 kV	Paddock 345/138 kV Xfmr
Darlington - North Monroe 138 kV	Paddock 345/138 kV Xfmr
Nelson Dewey 161/138 kV Xfmr	Paddock 345/138 kV Xfmr
North Monroe - Albany 138 kV	Paddock 345/138 kV Xfmr
Townline - Bass Creek 138 kV	Paddock 345/138 kV Xfmr
Kilbourn 138/69 kV Xfmr Ckt 2	Kilbourn 138/69 kV Xfmr Ckt 1
Badger 138/115 kV Xfmr	North Appleton - West Warner 345 kV
Ellington - Hintz 138 kV	North Appleton - West Warner 345 kV
Kilbourn 138/69 kV Xfmr Ckt 1	North Appleton - West Warner 345 kV
West Warner - Warner 138 kV	North Appleton - West Warner 345 kV
Arrowhead - Potlatch 230 kV	King - Eau Claire 345 kV
Arrowhead - Potlatch 230 kV	Weston Unit 4
Badger - Bell Pln 115 kV	Weston Unit 4
Eau Claire - Arpin 345 kV	Weston Unit 4
North Appleton - West Warner 345 kV	Weston Unit 4
Indalk 138/69 kV Xfmr Ckt 2	Indalk 138/69 kV Xfmr Ckt 1
Strait - Pine River 69 kV	Indalk 138/69 kV Xfmr Ckt 1
Strait - Pine River 69 kV	Hiawatha - Lakehead 138 kV
Oak Creek 345/230 kV Xfmr Ckt 1	Oak Creek 230 kV Bus Tie

Element	Contingency
Oak Creek 345/230 kV Xfmr Ckt 1	Oak Creek 345/230 kV Xfmr Ckt 2
Bain - Kenosha 138 kV	Zion - Pleasant Prairie 345 kV
Kenosha - Lakeview 138 kV	Zion - Pleasant Prairie 345 kV
Zion - Arcadia 345 kV	Zion - Pleasant Prairie 345 kV
Albers - Bain 138 kV	Bain - Kenosha 138 kV
Albers - Kenosha 138 kV	Bain - Kenosha 138 kV
Paris - Albers 138 kV	Pleasant Prairie - Racine 345 kV
Pleasant Prairie - Arcadia 345 kV	Pleasant Prairie - Racine 345 kV
Paris - Albers 138 kV	Wempletown - Rockdale 345 kV
Blackhawk - Colley Rd. 138 kV	Wempletown - Rockdale 345 kV
Cassville - Nelson Dewey 161 kV	Wempletown - Rockdale 345 kV
Eau Claire - Arpin 345 kV	Wempletown - Rockdale 345 kV
Nelson Dewey 161/138 kV Xfmr	Wempletown - Rockdale 345 kV
Paddock - Townline 138 kV	Wempletown - Rockdale 345 kV
Paddock 345/138 kV Xfmr	Wempletown - Rockdale 345 kV
Pleasant Prairie - Racine 345 kV	Wempletown - Rockdale 345 kV
Russell - Rockdale 138 kV	Wempletown - Rockdale 345 kV
Townline - BOC 138 kV	Wempletown - Rockdale 345 kV
Zion - Pleasant Prairie 345 kV	Wempletown - Rockdale 345 kV
Zion - Arcadia 345 kV	Wempletown - Paddock 345 kV
Zion - Pleasant Prairie 345 kV	Wempletown - Paddock 345 kV
Pleasant Prairie - Racine 345 kV	Arcadia - Pleasant Prairie 345 kV
N. LaCrosse - Mayfair 161 kV	LaCrosse - LaCrosse Tap 161 kV
Lansing - Genoa 161 kV	N. Rochester - N. LaCrosse 345 kV
Genoa - LaCrosse Tap 161 kV	Coulee - Genoa 161 kV
Turkey River - Cassville 161 Kv	Seneca - Genoa 161 kV
Nelson Dewey 161/138 kV Xfmr	Wempletown - Paddock 345 kV

≥ 100 kV Results Summary

- Without MVPs
  - 224 unique monitored element constraints
  - 37 negative FCITC
    - 21 identified as valid constraints in MTEP10 Appendix D3 (Reliability Analysis Results)
      - 16 have system adjustments as documented mitigations
      - 3 have non-MVP projects as documented mitigations
      - 2 have MVP projects as documented mitigations
    - 16 not in MTEP10 Appendix D3
      - 9 are external to the Midwest ISO footprint
      - 7 were identified as constraints in Phase 1 Reliability Analyses. Some MVPs were identified as mitigations to these constraints and included in Phase 2 models
        - » Fargo-Galesburg-Oak Grove 345 kV
        - » Webster-Blackhawk-Hazelton 345 kV
        - » Brooking County-Twin Cities 345 kV
        - » Ottumwa-Adair-Thomas Hill 345 kV
- With MVPs
  - 153 mitigated for 10.2 GW transfer
  - 85 unique monitored element constraints
  - 16 negative FCITC
    - 10 identified as valid constraints in MTEP10 Appendix D3 (Reliability Analysis Results)
      - 8 have system adjustments as documented mitigations
      - 2 have non-MVP projects as documented mitigations
    - 6 not in MTEP10 Appendix D3
      - 5 are external to the Midwest ISO footprint
      - 1 was due to increasing AEP wind at Reynolds above the MTEP10 dispatch
  - 14 new (not seen without MVPs)
    - 3 have new MVP equipment as either the monitored element or contingency
  - 17 lower FCITC (decreased transfer capability compared to without MVPs)
  - 54 higher FCITCs (increased TC compared to w/o MVPs)

Feedback Needed

- 69 kV Constraints
  - 98 unique monitored element constraints
  - No feedback received on validity
  - None were passed to PROMOD

- Category C Constraints
  - Will be considered in System Performance Analysis and system reinforcements identified per TPL requirements
    - Planned plus Forced Outage combinations that result in mitigations which exceed TP-BPM thresholds recommended to be studied in PROMOD
    - What about including other Category C events (Bus/Breaker Faults, Double Circuit Tower Outages) in PROMOD event file not monitored in real time?

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2011 Candidate MVP Portfolio Short-circuit Analysis
Default Midwest ISO Short-circuit Methodology

- Complies with all provisions of IEEE/ANSI Standard C37.010-1999 regarding fault duty calculations.
- Flags circuit breakers for replacement when the worst case fault current interruption exposure on a specific circuit breaker is greater than 95% of the fault interrupting capability of the circuit breaker including all applicable derates.
- Reclosing derates only apply for fault scenarios where the circuit breaker is expected to automatically reclose (e.g., for breakers protecting both a line with reclosing and bus without reclosing, reclosing derates would apply only for line faults).
- Worst case fault current interruption exposure may consider three-phase, phase-to-ground and double-phase-to-ground faults with zero fault impedance.
- Worst case conditions will include all network buses and branches modeled under normal conditions.

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2011 Candidate MVP Portfolio Short-circuit Analysis
Default Midwest ISO Short-circuit Methodology

- Worst case conditions will include all modeled generation on-line.
- Worst case conditions will utilize the subtransient reactance or equivalent for all generators.
- Worst case conditions will consider fault exposure on a circuit breaker resulting from normal clearing or backup clearing triggered by the failure of a single circuit breaker (i.e., operation of a breaker failure relay scheme).
- For a branch fault, worst case conditions will simulate the location of the fault at the branch-side terminals of the circuit breaker in question.
- Worst case conditions will assume circuit breakers at all other terminals of the protected branch or bus have already opened. This is generally less than the total fault current, but represents the highest fault current for which the circuit breaker in question is exposed.

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Agenda

• 10:00	Welcome and Roll Call	M. Tackett
• 10:15	Revised FCITC Results	D. Chatterjee
• 11:00	Break	
• **11:15**	**Detailed Study Flowchart and Process**	**D. Chatterjee**
• 12:00	Lunch	
• 1:00	Project Plan Modifications	R. Pulkrabek
• 1:30	Status Report and Action Items	R. Pulkrabek
• 2:00	Next Steps	M. Tackett

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Milestone Changes

- As described in previous slides, Candidate MVP needs to adjust the order of some of the work.
- The iterative energy delivery/steady state cycles need to be complete before the stability analysis can start.
- Milestones have been adjusted to reflect these changes. Final study completion date unchanged.

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New Candidate MVP Milestones (December re-baseline)

	Initial	Adjusted	Actual
• Stakeholder Kick-off	09/23/10		9/23/10
• Baseline project plan	10/04/10		10/04/10
• Final Generation Modeling Complete	10/06/10	11/12/10	11/12/10
• Final Powerflow Model Posted	11/05/10	01/15/11	
• Energy Delivery Promod Model Complete	10/27/10	11/12/10	11/12/10
• Initial Energy Delivery Execution Complete	12/10/10	12/10/10	
• Steady State Reliability Analysis Complete	01/11/10	03/28/11	
• Transient Stability Complete	05/04/11	06/02/11	
• Voltage Stability Analysis Complete	02/04/11	05/30/11	
• Small Signal Analysis Complete	04/11/11	06/01/11	
• Short Circuit Analysis Complete	05/13/11	05/13/11	
• Economic Value Analysis Complete	06/21/11	05/30/11	
• Business Case Analysis Complete	06/30/11	06/23/11	
• MVP Qualification Complete	06/20/11	06/14/11	
• Candidate MVP Analysis Complete	07/01/11	07/01/11	
• Submit Final Portfolio to MTEP Appendix A	07/16/11	07/19/11	
• Complete MTEP Executive Summary draft	08/02/11	08/02/11	
• Complete Candidate MVP 2011 Final Report	09/19/11	09/19/11	

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Diagram of critical work as modeled in November

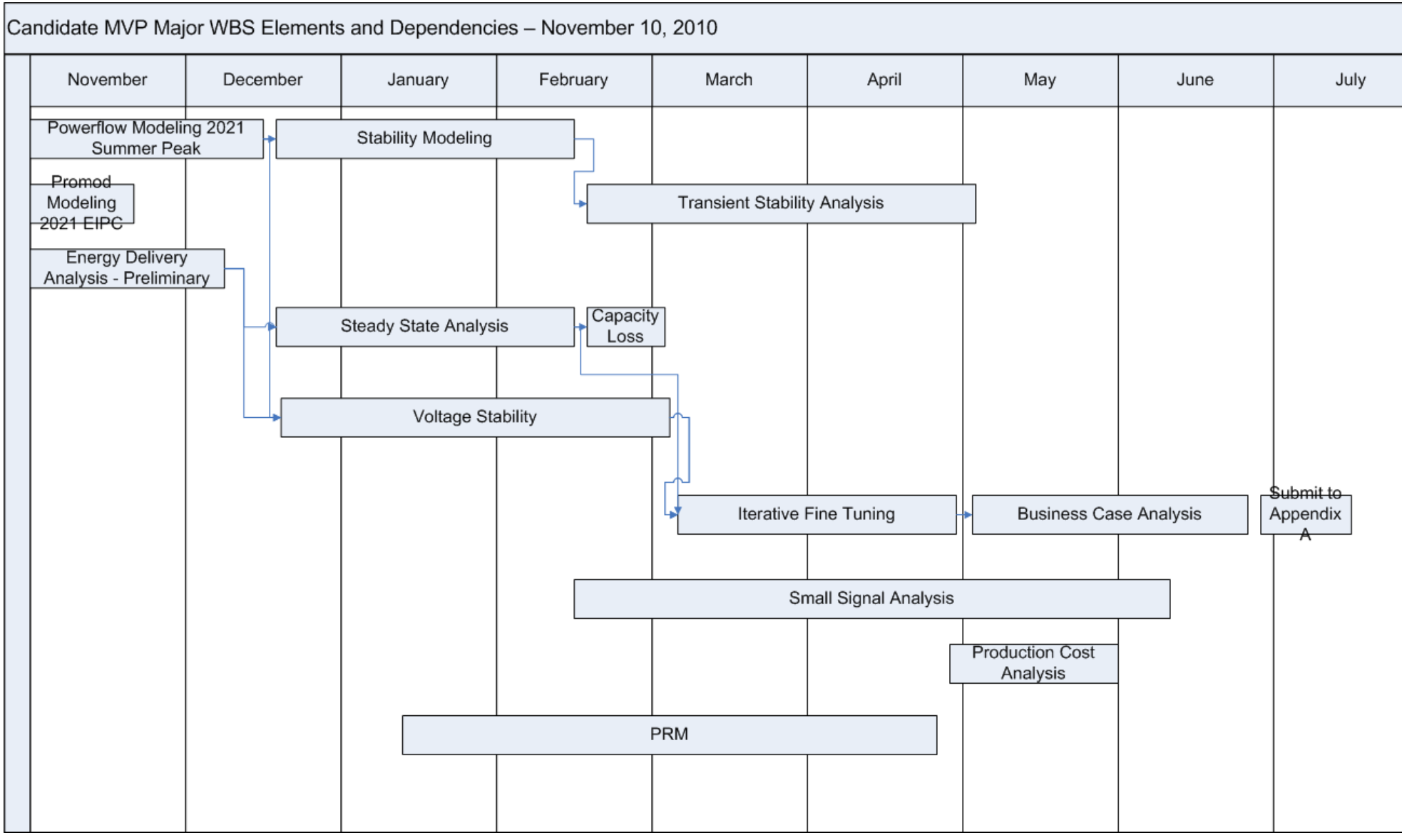

Diagram of critical work as adjusted in December

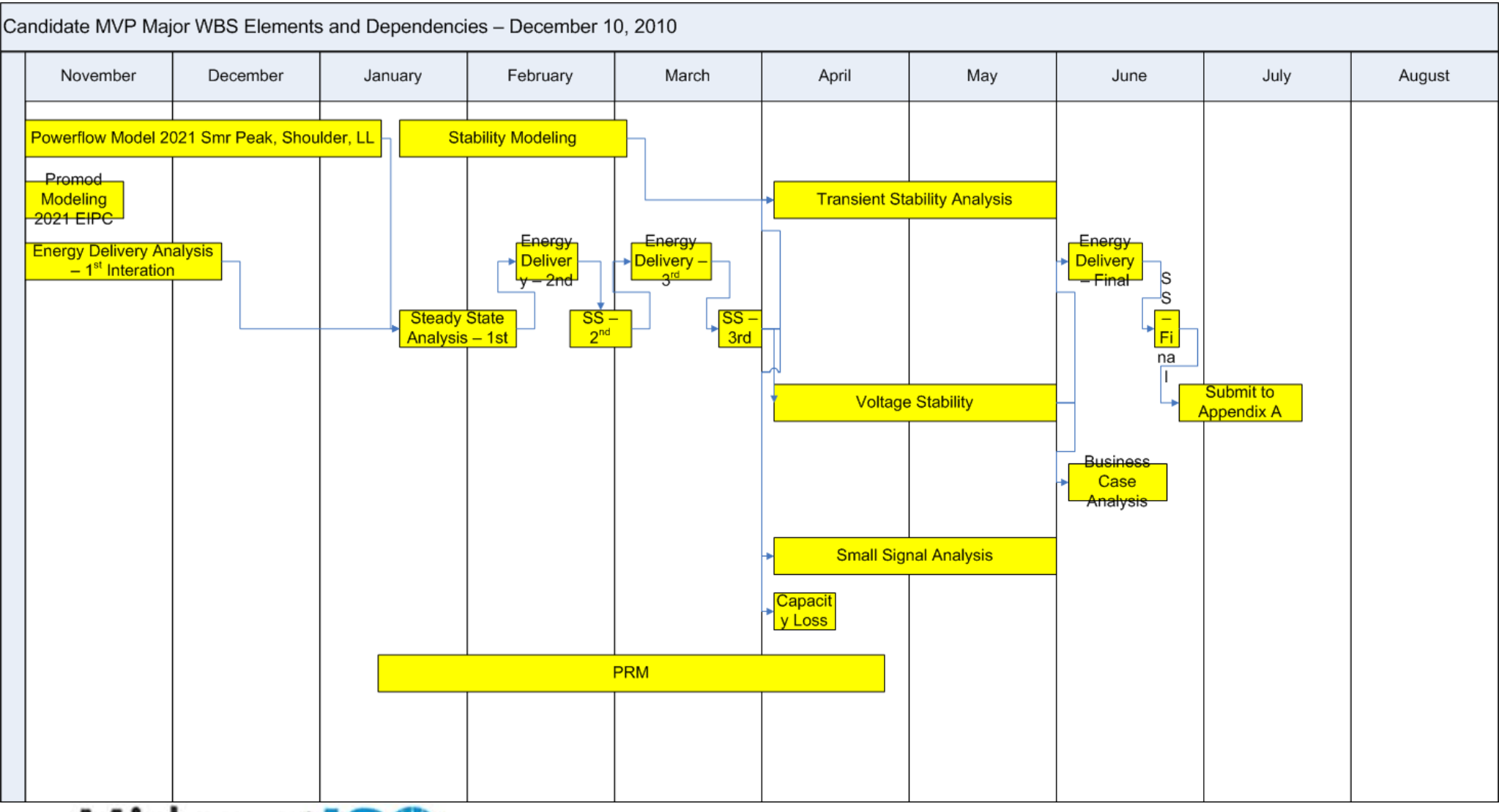

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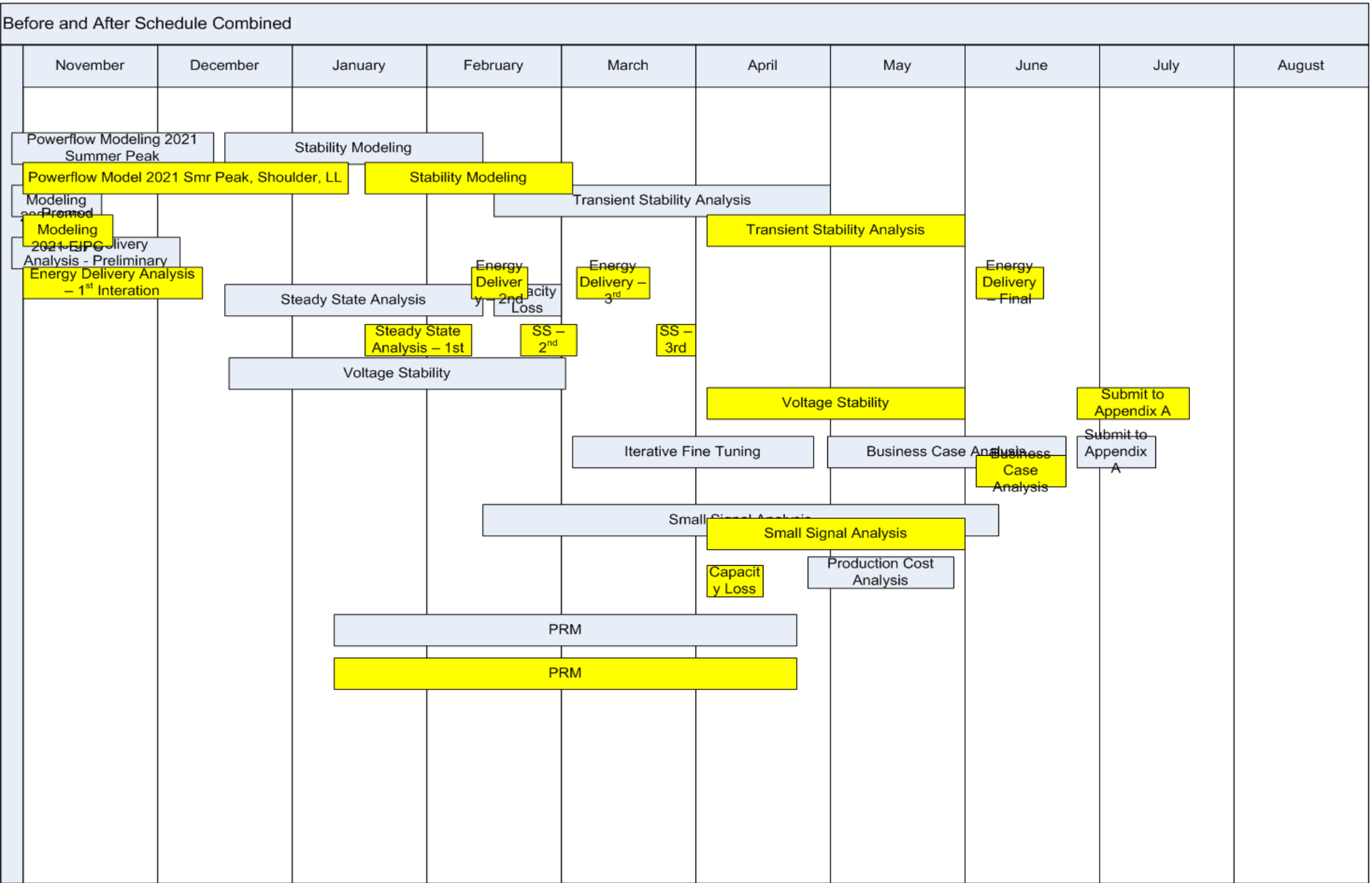
Diagram of critical work: Combined



Schedule Change Summary

- Significant mid-study milestone changes, due to energy delivery/steady state adjustments, but ultimate July milestone ok.
- Main change was moving iterative fine tuning from March-April to January-March, and moving voltage, transient, and small signal out from January-March to April-May.
- Other significant change from baseline is moving Powerflow modeling completion to mid January.

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Progress Since 11/10/10 TSTF

- Executed PROMOD processing to analyze curtailments and utilization.
- Met with PJM management and engineers about Candidate MVP coordination with PJM – 12/7/10.
- Presented study updates to Central and East SPMs- 12/6/10 and 12/8/10.
- Prepared for 12/13/10 TSTF stakeholder meeting.
- Revised schedule milestones to incorporate Energy Delivery/Steady State iterations earlier, causing other work to move later. See revised milestones below.
- Completed 2021 Energy Delivery Production Cost Modeling (PROMOD)
- Added Candidate MVP transmission set to Powerflow Model
- Received some replies from Transmission Owners with detailed MVP transmission project information (12/15/10 deadline)

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Upcoming Activities

- Complete Powerflow Modeling
- Use market dispatch to model new wind (SCED) on 2021 AC Powerflow model
- Start Steady State Analysis
- Finalize and post scope of work document

TSTF Schedule

September	23	Thursday	9-5 ET	Carmel	Cat-A, B
October	25	Monday	10-5 ET	Carmel	Cat-A, B
November	10	Thursday	9-5 CT	St. Paul	SP-A, B
December	13	Monday	10-5 ET	Carmel	Cat-A, B
January	27	Thursday	9-5 ET	Carmel	Cat-A, B
February	25	Monday	9-5 CT	St. Paul	SP-A, B
March	24	Thursday	9-5 ET	Carmel	Cat-A, B
April	25	Monday	9-5 ET	Carmel	Cat-A, B
May	26	Thursday	9-5 CT	St. Paul	SP-A, B
June	20	Monday	9-5 ET	Carmel	Cat-A, B
July	28	Thursday	9-5 ET	Carmel	Cat-A, B
August	22	Monday	9-5 CT	St. Paul	SP-A, B

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Action Items from 11/10/10 TSTF

Status	Issue/Action Item	Assigned To	Due Date	Comments
Closed	Midwest ISO needs to inform PJM of study progress.	Matt Tackett	12/13/2010	Jeff Webb sent letter to PJM planners, and scheduled joint PJM-Midwest ISO meeting for December 7. Also, PJM TO's involved in regular Candidate MVP stakholder meetings. 12/8/10 - Joint meeting held.
Closed	Post event file for stakeholder review	Lynn Hecker	12/13/2010	Posted 11/11/10
Closed	Include phone numbers of team members	Ryan Pulkrabek	12/13/2010	Added to Status report, and will include in next stakeholder ppt.
Closed	Send ATC transmission project requests to Sonja and Pat.	Matt Tackett	12/13/2010	11/12/10 - Sent ATC requests to Pat and Sonja.
Closed	Post information on all generation units scaled down during transfer for source/sink.	Digaunto Chatterjee	12/13/2010	11/12/10 - posted text file at ftp://mtep.midwestiso.org/mtep11/CMVPP1_Study/Transfer_Analysis/ with the details of the FCITC source and sink used in the analyses.

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Action Items from 11/10/10 TSTF

Closed	From Marlin Vrbas: In the MVP presentation this morning I noticed that slide 48 showing Area 1, southern MN, did not recognize the Fox Lake – Rutland constraint or show it as being mitigated by the MVP projects. I raised this concern on the call but wanted to follow up with this email to be sure that this constraint is modeled and addressed through the evaluation process. This constraint has been binding for hundreds of hours over the past year for at least four contingencies including: Lakefield to Lakefield Jct Lakefield Jct to Wilmart Byron to Prairie Island Forbes to Roseaun/Dorsey DC We would hope to see some assurances that the proposed MVP projects, particularly Lakefield Jct to Mitchell County, will mitigate this constraint.	Lynn Hecker	12/13/2010	11/22/10 - Lynn had extensive correspondence with Marlin. Together they identified constraints causing binding and adjusted model accordingly.

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Action Items from 11/10/10 TSTF

Closed	ComEd contingencies need to be simulated.	Digaunto Chatterjee	12/13/2010	Per Adam: added ComEd contingencies to our analysis
Closed	Review Indiana constraints, and provide explanation why none found in today's analysis.	Digaunto Chatterjee	12/13/2010	Per Adam: Since the last round of FCITC, we have dispatched AEP wind in the Dequine area, added ComEd contingencies, and removed the distribution factor cutoff. The results now show Reynolds – Monticello 138 kV, Lafayette – Staley Mfg 138 kV, and Sheffield – Marktown 138 kV as Northern Indiana FCITC constraints. We will continue to monitor this area as the MTEP11 models are built and determine any changes in the generation modeling. It is our intention to discriminate between constraints caused by renewable increases tied to RPS requirements and constraints caused by generation interconnections.
Closed	Post links for FCITC files.	Digaunto Chatterjee	12/13/2010	The location of the FCITC input files is ftp://mtep.midwestiso.org/mtep11/CMVPP1_Study/Transfer_Analysis/. Four analyses were run in MUST with the noMVP case: Five analyses were run in MUST with the wMVP case: The referenced contingency files are included in the subfolders for each region.
Closed	Short circuit: Need to investigate how we currently handle generator or load owned circuits with GIA's in study.	Matt Tackett	12/13/2010	12/2/10 - We can not cost share. Only Midwest TO owned equipment can be cost shared.

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Stakeholder Action Items

- Review and comment on materials posted for this 12/13/10 meeting
- **Reply by 12/15/10 to the request to TO's for transmission scope data**

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Candidate MVP Contacts

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- **Short-circuit Analysis Leads- Matt Tackett**
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- **Business Case Development Lead- Laura Rauch**
  - **Email:** lrauch@midwestiso.org. Phone: 317.249.5853

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